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Claims

[c1] What is claimed is:

1.A multiple step-sized levels adaptive method for time scaling to synthesize an $S_3[n]$ signal from an $S_1[n]$ signal and an $S_2[n]$ signal, the method comprising:

(a) calculating a first magnitude of a cross-correlation function of the $S_1[n]$ signal and the $S_2[n]$ signal according to a first index;

(b) comparing the first magnitude with a threshold value;

(c) if the first magnitude is smaller than the threshold value, calculating a first reference magnitude of the cross-correlation function of the $S_1[n]$ signal and the $S_2[n]$ signal according to a first reference index behind the first index by a first determined number, or calculating a second reference magnitude of the cross-correlation function of the $S_1[n]$ signal and the $S_2[n]$ signal according to a second reference index behind the first index by a second number; and

(d) synthesizing the $S_3[n]$ signal by adding the $S_1[n]$ signal to the $S_2[n]$ signal in accordance with a maximum index corresponding to a largest magnitude among all of the magnitudes calculated in step (c).

[c2] 2.The method of claim 1 wherein in step (d) the $S_1[n]$ signal is weighted and added to an $S_4[n]$ signal that lags the $S_2[n]$ signal by the maximum index to form the $S_3[n]$ signal.

[c3] 3.The method of claim 2 wherein the $S_1[n]$ signal has N_1 elements while the $S_2[n]$ signal has N_2 elements, and the $S_3[n]$ signal
= the $S_1[n]$ signal, where 0 <= n < the maximum index;
= $(N_1-n)/(N_1$ - the maximum index)*$S_1[n]+(n$ - the maximum index)/(N_1 - the maximum index)*$S_4[n$ - the maximum index], where the maximum index <= n < N_1;
= $S_4[n-$ the maximum index], where N_1 <= n <= N_2 - the maximum index.

[c4] 4.The method of claim 1 wherein step (c) further comprises:
(e) setting each of the magnitudes corresponding to indexes between the first index and the first or second reference index to zero.

[c5] 5.The method of claim 1 further comprising:
(f) updating the threshold value according to the maximum index.

[c6] 6.The method of claim 1 wherein the $S_1[n]$ signal and the $S_2[n]$ signal are sampled from an $S_1(t)$ signal and an $S_2(t)$

signal respectively.

[c7] 7.The method of claim 6 wherein the $S_1(t)$ signal and the $S_2(t)$ signal are both derived from an original signal.

[c8] 8.The method of claim 7 wherein the original signal is an audio signal.

[c9] 9.The method of claim 7 wherein the original signal is a video signal.

[c10] 10.The method of claim 7 wherein the $S_1(t)$ signal and the $S_2(t)$ signal are identical.

[c11] 11.The method of claim 7 wherein the $S_1(t)$ signal and the $S_2(t)$ signal are different from each other.

[c12] 12.The method of claim 1 wherein the second number is equal to one.

[c13] 13.The method of claim 1 wherein the first determined number is larger than one.

[c14] 14.A multiple step-sized levels adaptive method for time scaling to synthesize an $S_3[n]$ signal from an $S_1[n]$ signal and an $S_2[n]$ signal, the method comprising:
(a) delaying the $S_1[n]$ signal by a predetermined number to form an $S_5[n]$ signal;
(b) calculating a first magnitude of a cross-correlation

function of the $S_1[n]$ signal and $S_5[n]$ signal according to a first index;

(c) comparing the first magnitude with a threshold value;

(d) if the first magnitude is smaller than the threshold value, calculating a first reference magnitude of the cross-correlation function of the $S_1[n]$ signal and the $S_2[n]$ signal according to a first reference index behind the first index by a first determined number, or calculating a second reference magnitude of the cross-correlation function of the $S_1[n]$ signal and the $S_2[n]$ signal according to a second reference index behind the first index by a second number; and

(e) synthesizing the $S_3[n]$ signal by adding the $S_1[n]$ signal to the $S_2[n]$ signal in accordance with a maximum index corresponding to a largest magnitude among all of the magnitudes calculated in step (d).

[c15] 15.The method of claim 14 wherein in step (e) the $S_1[n]$ signal is weighted and added to an $S_4[n]$ signal that lags the $S_5[n]$ signal by the maximum index plus the predetermined number to form the $S_3[n]$ signal.

[c16] 16.The method of claim 15 wherein the $S_1[n]$ signal has N_1 elements while the $S_2[n]$ signal has N_2 elements, and the $S_3[n]$ signal equals:

= the $S_1[n]$ signal, where $0 <= n <$ (the predetermined number + the maximum index);

= $(N_1-n)/(N_1-$(the predetermined number + the maximum index))*$S_1[n]+$(n-(the predetermined number + the maximum index))/(N_1-(the predetermined number + the maximum index))* S_4[n-(the predetermined number + the maximum index)], where (the predetermined number + the maximum index) <= n < N_1;
= S_4[n-(the predetermined number + the maximum index)], where N_1 <= n <= (N_2 + the predetermined number + the maximum index).

[c17] 17.The method of claim 14 wherein step (d) further comprises:
(f) setting each of the magnitudes corresponding to indexes between the first index and the first or second reference index to zero.

[c18] 18.The method of claim 14 further comprising:
(g) updating the threshold value according to the maximum index.

[c19] 19.The method of claim 14 wherein the second number is equal to one.

[c20] 20.The method of claim 14 wherein the first determined number is larger than one.